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STUDIES ON SPIROBOLOID MILLIPEDS. V. THE CORRECT IDENTITY OF THE GENUS RHINOCRICUS, BASED UPON A STUDY OF ITS TYPE SPECIES[1]

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The great assemblage of spiroboloid millipeds which has been going under the name *Rhinocricus* has become, in the sense of current usage, the largest genus in the order Spirobolida (if not in the entire class Diplopoda) despite the periodic removal of small groups of its species under new generic names. Most rhinocricids adhere closely to a basic configuration of the male genitalia, while differing considerably in details of external body form, so that there has been little agreement among students of the group concerning either generic or specific definitions. This difficult situation is complicated by the fact that the gonopods of the type species of *Rhinocricus* have never been described. From 1894 to the present time, the genus has been defined inferentially by the characters of species only *presumed* to be congeneric with the true type!

The name *Rhinocricus* was first published by Ferdinand Karsch in 1881 as a subgeneric name under *Spirobolus,* and included 17 species none of which was designated as the type of the subgenus. In 1894, R. I. Pocock elevated *Rhinocricus* to the rank of genus, and properly selected as its type the species which Karsch described as *S. (R.) parcus* from specimens collected by Krug in Puerto Rico. Unfortunately, Pocock chose a form of which he had seen no specimens, and which was inadequately described to begin with. However, since most of the West Indian species of large spiroboloids were strictly congeneric, insofar as Pocock's generic concept was concerned, he

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assumed that *parcus* would likewise prove to represent the same genus.

With the subsequent refinement of generic and specific limits by Pocock's successors, however, it became evident that most of the older diplopod genera (including *Rhinocricus*) desirably should be fragmented into numerous smaller and more homogeneous groups the definition thereof depending chiefly upon the structure of the male genitalia. Down to the present, about 30 generic names have been proposed for various groups of rhinocricids, including a considerable number for West Indian forms. These names, unfortunately, have without exception been thrust into the literature solely upon the naive and myopic assumption that Pocock's original surmise about the identity of *R. parcus* was correct. This is unseemly. If we discard old ideas about generic limits we must in consistency hold in suspicion the old inferences about identities as well. It is most curious that Pocock did not take the trouble to borrow Karsch's type specimens, a precaution apparently disregarded by all subsequent workers, insofar as I can determine. Count Attems found a much easier, if unorthodox, way around the difficulty: in 1914 he merely stated that *Rhinocricus beauforti* Attems (which at that time had not even been described!) was the type species of *Rhinocricus* in the strict sense.

It can be appreciated that as things still stand, the family Rhinocricidae has had all the nomenclatorial stability of a house of cards, and that eventually something would have to be done about the identity of the true type species of the typical genus. The matter was nearly solved in 1941 when H. F. Loomis reported the collection of *R. parcus* (the identification almost certainly correct) in Puerto Rico by Dr. P. J. Darlington. Unfortunately no males were taken; Loomis could only note details of body form and sculpture, but his account is the only published record of the species since the time of its description.

In face of the probability that the original types of *R. parcus* are now either lost or destroyed, the eventual resolution of the problem has seemed to depend upon the collection of topotypical specimens from Puerto Rico. Fortunately, however, this requirement was recently obviated, and dispatch of the *Rhinocricus* question greatly accelerated, by a series of events including the following: (1) following the death of Dr. O. F.

Cook in 1949 a considerable quantity of his myriapod collection was returned to the U. S. National Museum, (2) the efforts of curator Ralph E. Crabill have resulted in reconditioning and assembling for the first time all of the Museum's extensive holdings in myriapod groups, and (3) the present writer was enabled to devote abundant time and effort to the examination of said material. During this activity two very interesting items were found: a microscopic slide mount of one of the posterior gonopods of the male cotype of *R. parcus,* and a jar containing several collections of a rhinocricid from Puerto Rico which agrees in every detail with the aforesaid slide mount. As there can be no doubt that these specimens are strictly conspecific with the cotypes of *Rhinocricus parcus,* it is now possible to establish the characters of the genus.

Unfortunately, *Rhinocricus parcus* is clearly not congeneric with the great majority of American species which have traditionally been included in *Rhinocricus.* These species will have to be covered with another (or several more) generic name, but since there is now some dissention about the definition of genera in the Rhinocricidae, this matter may be deferred for future settlement. *Rhinocricus* in the current usage is undoubtedly heterogeneous, but I do not think that arbitrary groupings on the basis of scobinae and antennal sensory cones will provide a natural generic system. A certain number of groups of American rhinocricids have been set off as genera on the basis of well-marked characters of the gonopods; these include *Cubocricus, Nesobolus,* and *Neocricus,* for instance. Some others appear to be fairly well defined by non-sexual developments, such as the species of *Thyroproctus* and *Oxypyge.* Remaining is a great residue of species with basically similar gonopods, the posterior pair of which (the phallopods) terminate in a larger, hyaline, laminate blade, and a much smaller, more falciform branch from about the midlength of the telopodite. This configuration is the common denominator for a large number of species of most variable size, shape, and external structure which have generally been considered as "*Rhinocricus*" by virtually all workers. The presence or absence of scobinae, number of antennal sensory cones, and production of the epiproct into a caudal projection have all been used both singly and in combinations to define various "genera," but it

is my conviction that such characters cut across genera based upon gonopod structure, and are at best of specific value. Obviously, most of the numerous American species described in *Rhinocricus* (as well as the several artificial satellite genera) will have to be carefully restudied, particularly with reference to the normally concealed internal parts of the gonopods, before a rational generic classification can be achieved. In recent years the present writer has suggested a redefinition of *Eurhinocricus* on the basis of gonopod structure instead of external characters, but even this does not result in a clearly distinct group of species.

At the present, however, there seems to be no question about the distinctness of the group of species having a simple, falciform phallopod, which was designated as *Cubocricus* in 1922 by R. V. Chamberlin, and to which *R. parcus* clearly is referable. The restriction of *Rhinocricus* to this ensemble throws open the problem of which of the numerous existing generic names are to be used for the redefined American genera. This matter will be simplified somewhat by the compilation of spiroboloid generic names (now in press) prepared by Dr. Keeton and me, but it may be mentioned in passing that the second oldest available name (discounting both *Oxypyge* and *Thyroproctus*) for consideration—*Anadenobolus* Silvestri—poses a serious difficulty. It was based upon *Spirobolus politus* Porat (1888) from Antigua, a species first referred to *Rhinocricus* by Pocock in 1894. Porat's types were females, and insofar as I know, topotypical males remain to be secured. Until this be done, *Anadenobolus* will remain an outstanding hazard to further nomenclatorial stability in the family.

Genus *Rhinocricus* Karsch

Rhinocricus Karsch, 1881, Zeitschr. Naturwiss., 54: 68 (as subgenus of *Spirobolus*).—Pocock, 1894, J. Linnean Soc. London (Zool.), 24: 485.

Cubocricus Chamberlin, 1922, Proc. U. S. Nat. Mus., 61(10): 5 (orthotype: *Rhinocricus suprenans* Chamberlin, 1918). NEW SYNONYMY.

Type species: Spirobolus (*Rhinocricus*) *parcus* Karsch, 1881, by subsequent designation of Pocock, 1894.

Diagnosis: Medium to large rhinocricids characterized by the form of the male gonopods: coleopods typical in form for the family but with deep cavities between coxae and sternite on the anterior side; phallopods with the telopodite slender, unbranched, and falciform. In the known

species antennal sensory cones are numerous and ventral tarsal pads are present in males on at least the anterior legs.

Range: Cuba and Puerto Rico [Hispaniola?].

Species: Four are definitely known. In addition, Loomis (1936) considered *Julus haitiensis* Gervais to be congeneric with the Cuban species, although this allocation will have to be verified. The discovery of species of *Rhinocricus* in Hispaniola is anticipated.

Remarks: The remarkable similarity of the Antillean genus *Rhinocricus* to *Acladocricus* of the East Indian region cannot be overlooked. I have had no species of the latter genus for study, but literature descriptions indicate virtual concordance in gonopod structure with typical species of *Rhinocricus,* and if future comparison of specimens can reveal no differences, *Acladocricus* (Brolemann, 1913) will fall as a junior subjective synonym of *Rhinocricus.* The resulting generic discontinuity finds a parallel, among diplopods, at least in the archaic genus *Glomeridesmus,* and numerous families are now largely restricted in their distribution to the two Indies.

In addition to a redescription of *R. parcus,* I include here a roster of its congeners with literature references and some descriptive notes, which should for the present obviate the preparation of a key. As the gonopods are quite similar in all of the known species, specific characters must be drawn largely from details of body form.

Rhinocricus parcus Karsch
Figs. 1–4

Spirobolus (*Rhinocricus*) *parcus* Karsch, 1881, Zeitschr. Naturwiss., 54: 68.

Rhinocricus parcus Pocock, 1894, J. Linnean Soc. London (Zool.), 24: 485.—Loomis, 1941, Bull. Mus. Comp. Zool., 88: 38, fig. 11.

Type specimens: Cotypes, a male and female, collected by Krug in Puerto Rico, originally in the Berlin Museum (present condition unknown). One phallopod and the first legpair of the male in the U. S. Nat. Mus., Diplopod Type slides 1 and 2.

Diagnosis: A small member of the genus with large, deep scobinae on segments 8–12 and with prominent tarsal pads on all legs of the males.

Descriptive notes (adult male from Aguirre): A robust, stout-bodied spiroboloid, length ca. 85 mm, greatest diameter, 10.5 mm. Color largely faded from long preservation. Body with 43 segments.

Head small, moderately convex, smooth and polished; vertigial and clypeal sutures very short and indistinct, latter detectable nearly to level of antennal sockets. Labrum distinct, recessed below level of clypeus, with three distinct labral teeth all of equal length but the median somewhat the largest. Labral setae 10-10, stout, decurved; clypeal setal foveolae 2-2, the four pits set exactly equidistant from each other. Genae very slightly depressed below antennae, the ventral half of the edges round and immarginate but dorsal half set off by a fine marginal groove. Parietal sclerite distinct, with the shape of an elongate right triangle, its lateral

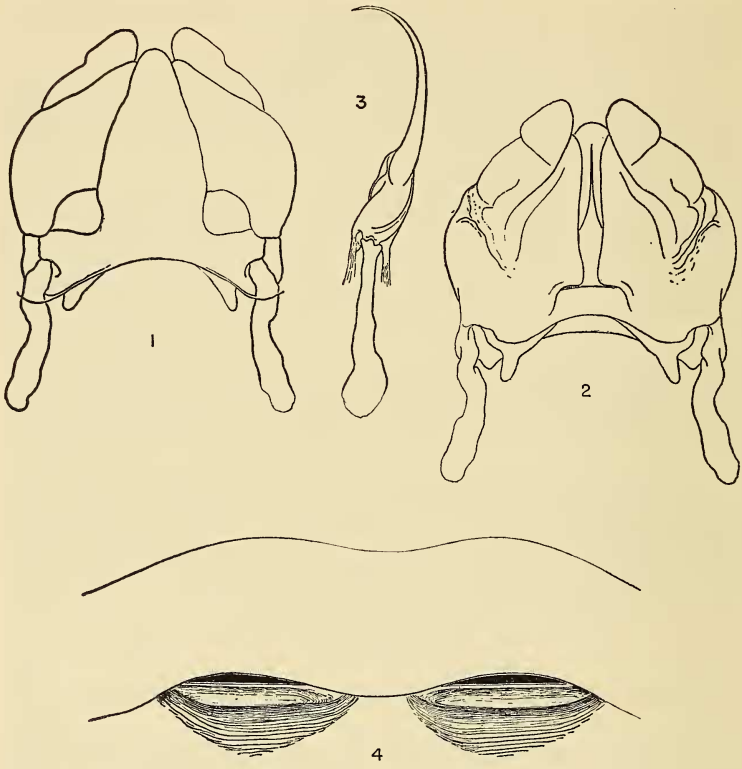

FIG. 1–4

edge set off by a broad elevated margin, the plate otherwise smooth and flat, continuing slope of the head. Ocellaria small and ovoid, about the size of an antennal socket, separated by a distance about 4 times an ocellarian diameter; each with 24 ocelli in 6 rows, those of the ventralmost row largest.

Antennae of moderate length, attaining base of 3rd segment when appressed caudally; antennal articles generally subequal in size except the 2nd, longest, and 6th, widest; the three basal articles glabrous, the four distal becoming increasingly setose; 7th article short, broad, and flattened, with about 20 sensory cones.

Collum broad, smooth, symmetrical, the anterior lateral marginal groove indistinct and short, not extending up as far as edge of the parietal sclerite. Pleurotergite of 2nd segment produced cephaloventrad below ends of collum, this portion with a few indistinct grooves.

Prozonites of most body segments with a few fine transverse striae on the anterior half; mesozonites and metazonites smooth, but the former with a distinct median suture across the dorsum between the lateral longi-

tudinal sutures. Ozopores large and distinct, located in the mesozonites considerably below the level of the lateral sutures (as shown in Fig. 11 of the 1941 paper by Loomis), the peritreme smooth and polished, very slightly elevated.

Scobinae (Fig. 4) very large and transverse, occurring on segments 8–13, with the posterior edge of the preceding segments slightly concave in front of each scobina.

Pleurites and lower parts of mesozonites and metazonites with very fine striae, these turning dorsad and merging with the transverse striae of the prozonite. Pleurites about two-thirds as wide as long, flat except for the distinctly depressed caudal third. Sternites flat, with about 10–12 distinct transverse striae; stigmata smooth and polished, the stigmal opening longitudinally ellipsoid, each located in a circular depression confined entirely to the sternum.

Legs very short, not attaining level of sides of body when extended and thus invisible in dorsal aspect, the joints smooth and polished, ventral setae 1-1-1-1-1-2, pretarsus small, but slender and acute, with a large dorsal tarsal macroseta near its base. All tarsi with large and conspicuous ventral pads, also the ventral surface of the prefemora calloused and semimembranous. Legs in front of gonopods without any sort of modifications.

Body tapering gradually over the last 15 segments, the two or three segments in front of the anal ring somewhat smaller in proportion and slightly telescoped. Anal segment smooth, with a broad, bluntly triangular epiproct which does not cover more than basal half of the paraprocts. Latter large, only slightly convex, and with distinctly enlarged but not basally margined free edges. Hypoproct large, distinct, its free edge semicircular, extending laterally as far as ends of the femora of the last legpair.

Sympleurite of 7th segment narrow, simple, slightly elevated; with a trace of the median suture evident. Gonopods large, of the form shown in Figs. 1–3. Sternite of coleopods transverse and slightly arched, with a large triangular median projection as typical for the family, slightly surpassing apices of coxae but shorter than tips of telopodites. In anterior aspect, a deep, semicircular depression occurs on each side between sternite and base of coxae. Sternal apodeme of moderate length, slender, a little sinuous. Coxal apodeme short, bluntly acuminate, its base concealed by a small lobe of the coxal posterior edge. A distinct, darkly pigmented median piece separates the bases of the coxae. Telopodite of moderate size, vaguely articulated to the coxa, its distal reflexed lobe only slightly set off by a shallow groove. Phallopods completely separate, not completely concealed within the gonocoel of the coleopods, the apodeme slender at the base and abruptly enlarged and spatulate distally. Coxal portion of phallopod slender, flattened, showing some traces of torsion, merging evenly into the very slender, unbranched, falcate telopodite blade, the latter with the usual small basal enlargement of the seminal groove. In situ, the distal half of the telopodite projects beyond the apices of the coleopod.

Material examined: PUERTO RICO: Aguirre, 2♂♂, 2♀♀, June 1901;

Aibonito, 1 ♂, 28 June 1901; between Yauco and Guayanilla, 2 ♀ ♀, July 1901. All collections by O. F. Cook.

Variation: Meristic data were taken from the five mature specimens from Aguirre and Aibonito, 3 ♂ ♂ and 2 ♀ ♀. This small series shows considerable homogeneity and no evident sexual dimorphism. Length ranges from 70 to 90 mm (average 82 mm), diameter from 7.5 to 11.5 mm (10.1 mm); segments 43, 43, 43, 44, 45 (43.6); ocelli 24 to 30 (26.3) on each side; labral setae 16 to 22 (18.4). Scobinae occur on segments 8–12 in all except the described male, where they occur on segment 13 as well.

The cotypes measured 80 mm (♀) and 115 mm (♂) in length, both had 43 segments, and scobinae on segments 8–12. Loomis's female was 64 mm long, 9 mm in diameter, with 44 segments. Apparently the species is not a variable one.

Distribution: The specimens obtained by Dr. Cook originated from three localities on the southern half of Puerto Rico. The specimen taken by Darlington in June 1938 came from the Maricao Forest in the southwestern portion of the island, and it may be found that the species is restricted to the Cordillera Central and its southern foothills.

Rhinocricus duvernoyi Karsch

Spirobolus (*Rhinocricus*) *duvernoyi* Karsch, 1881, Zeitschr. Naturwiss., 54: 77.

Rhinocricus duvernoyi Pocock, 1894, J. Linnean Soc. London (Zool.), 24: 496—Chamberlin, 1918, Bull. Mus. Comp. Zool., 62: 193.

Cubocricus duvernoyi Chamberlin, 1922, Proc. U. S. Nat. Mus., 61(10): 5.

Type specimen: Female, originally in the Berlin Museum (present status unknown), collected by Otto in Cuba.

Remarks: The characters of this species are difficult to make out from the original description which provides little more than generic details. Scobinae are said to extend from the 8th to 20th segment, segment number is 50, and the length 135 mm. Chamberlin (1918) associated the name with specimens from three localities in Cuba, representing a species having 49 to 53 segments and all but the most caudal legs of the males with tarsal pads.

Chamberlin's material came from Santiago de las Vegas and Guanajay, Pinar del Rio Province, and Guantanamo, in Oriente. One is inclined to wonder if perhaps the last record might not be mislabeled or otherwise spurious.

Rhinocricus suprenans Chamberlin

Rhinocricus suprenans Chamberlin, 1918, Bull. Mus. Comp. Zool., 62: 193.

Cubocricus suprenans Chamberlin, 1922, Proc. U. S. Nat. Mus., 61(10): 5.—Loomis, 1938, Bull. Mus. Comp. Zool., 82: 450.

Type specimen: Male, Mus. Comp. Zool., collected at Baracoa, Oriente Prov., Cuba, by W. O. Crosby.

Remarks: This form was separated from *duvernoyi* chiefly on the basis of color differences and less distinct segmental sulci. A perhaps more tangible difference obtains in the tarsal pads of males, said to extend

nearly to the last segments in *duvernoyi* but restricted to the anteriormost legs of *suprenans*. The difference in segment number (46–47 vs. 49–53) is not sufficiently documented by counts from series.

R. suprenans is apparently easily separated from *R. maximus* by the considerably greater segment number, 51–56, of the latter, as well as by details of the gonopods. The other differences cited by Loomis (size, color, form of the collum) are probably not reliable, however. A previously unnoticed distinction lies in leg size: the legs extend beyond the body in *suprenans* but are not visible from above in *maximus*.

Loomis reported numerous specimens of *suprenans* collected by P. J. Darlington in three localities in Oriente Province, Cuba, to which the form may be restricted.

I have examined topotypes of the species in the U. S. National Museum collections.

Rhinocricus maximus maximus (Loomis), new status and new combination

Cubocricus maximus Loomis, 1933, Bull. Mus. Comp. Zool., 75: 358, Figs. 5, 6; 1938, idem, 82: 450.

Type specimen: Male, Mus. Comp. Zool., collected at Central Jaronu, Camaguey Prov., Cuba, by L. D. Christianson, June 1931.

Remarks: The trinomial combination is adopted here to put the typical population of *maximus* on an equivalent standing with the "variety" *bartschi* of Loomis, probably a valid subspecies.

Loomis (1938) has discussed variation in a series of specimens taken in the Cubitas Forest, also in Camaguey Province. These two records suggest that perhaps the Cuban species of *Rhinocricus* are geographically vicarious, with *suprenans* occurring in the mountains of Oriente, *maximus maximus* in the central lowlands, *maximus bartschi* on the Isle of Pines, and *duvernoyi* in Pinar del Rio. Naturally, a large number of additional samples will have to be forthcoming before the status of these large millipeds can be worked out. In addition to the various characters cited (segment number, tarsal pads), an additional one may be mentioned for the attention of future workers: this is the shape and sculpture of the parietal sclerite which seems to be distinctive for each of the forms which I have examined (*parcus, suprenans,* and *m. bartschi*).

I have seen the long type series of *bartschi* collected on the Isle of Pines in April 1937 by Paul Bartsch, the form appearing to be only partially differentiated from the mainland population of *maximus*.

Rhinocricus maximus bartschi (Loomis), new combination

Cubocricus maximus bartschi Loomis, 1938, Bull. Mus. Comp. Zool., 82: 451.

Type specimen: Male, U. S. Nat. Mus. Myriapod Type No. 2364, collected in the Sierra de Casas, Isle of Pines, Cuba, by Paul Bartsch, 14 April 1937.

Loomis has discussed the characters and variation of this subspecies in the original description. The segment count is rather uniform, 50 to

53, but the length of adult specimens varies from 95 to 165 mm, a remarkable range!

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Explanation of Figures

Figs. 1–4. *Rhinocricus parcus* Karsch, specimen from Aguirre, Puerto Rico, all figures to same scale. 1. Anterior aspect of coleopods; 2. Posterior aspect of coleopods; 3. Posterior aspect of right phallopod; 4. Scobinae of 10th segment, the posterior edge of segment 9 pulled forward slightly.